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EVALUATION OF ROCKHOPPER TRAWL CATCHES IN THE MAIN CHANNEL OF POOLS 8 AND 13 OF THE UPPER MISSISSIPPI RIVER

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Submitted to:

The Upper Mississippi Environmental Sciences Center,
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FINAL REPORT

July 1999

Aquatic Ecology Technical Report 99/8

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October 1, 1997 - July 31, 1999

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This study was conducted through a cooperative agreement between the U.S. Geological Survey and the Board of Trustees of the University of Illinois. The actual research was a collaborative effort by the Illinois Natural History Survey and the Upper Midwest Environmental Sciences Center. Primary funding for the project was provided by Long-term Resource Monitoring Program, with additional support from the U. S. Geological Survey, and the Illinois Natural History Survey. The form, content, and data interpretation are the responsibility of the U. S. Geological Survey, University of Illinois, and the Illinois Natural History Survey, not the Illinois Department of Natural Resources.

Abstract

The main channel of large river ecosystems is a difficult aquatic area to sample with most fish sampling techniques because of high current velocities and substantial depth. Sampling with a 10-m rockhopper bottom trawl was conducted in Pools 8 and 13 of the Upper Mississippi River to investigate the effectiveness of this gear in the main channel and selected secondary channels. Sampling occurred at several sites along each pool in late November and early December. Shorthead redhorse *Moxostoma macrolepidotum*, shovelnose sturgeon *Scaphirhynchus platorynchus*, silver chub *Macrhybopsis storeriana*, and sauger *Stizostedion canadense* had the greatest catch rates in both Pools 8 and 13. Species richness in the main channel was similar in both pools (13 and 14 species in Pools 8 and 13, respectively). Species thought to be rare (e.g. blue sucker *Cycleptus elongatus*) were also collected. Within each pool, the main channel fish assemblage appeared to differ; upper pool sites generally held more species and greater numbers of fish than lower pool sites. The rockhopper trawl also effectively collected fish in two side channels. We conclude that rockhopper trawling in the main channel is an effective method to evaluate this important but poorly sampled aquatic area of large river ecosystems.

Introduction

The main channel of large floodplain rivers is a difficult aquatic area in which to sample fishes because of high current velocities, deep water, and heavy commercial and recreational vessel traffic. As a result, little is known about fish assemblages in this important aquatic area. However, quantifying the abundance of fishes present in the main channel and determining which species use this aquatic area can provide the basis for evaluating how important the main channel is for fishes in large rivers. The ability to collect fish in the main channel also allows resource management agencies to evaluate the potential impact of commercial navigation activities on fishes using this aquatic area. Effectively sampling the main channel, when combined with ongoing sampling in channel border, side channel, and backwater habitats should provide river managers a more informed basis for decision-making regarding critical habitat needs for the entire assemblage of fishes using the Upper Mississippi River.

The Long Term Resource Monitoring Program (LTRMP) presently samples fishes from Pools 4, 8, 13, and 26, and an unimpounded reach of the Mississippi River, and from the La Grange Pool of the Illinois River. The LTRMP sampling employs hoop nets, shoreline electrofishing, mini fyke nets, and seining in shallow areas; trawling is conducted at tailwaters but is optional at main channel and side channel aquatic areas (Gutreuter et al. 1995). The LTRMP trawl is small (4.5-m footrope with 18-mm stretch mesh), and captures mainly small fishes. The Iowa Department of Natural Resources conducts similar trawling more broadly in Iowa waters of the Mississippi River (John Pitlo, Iowa Department of Natural Resources, personal communication). Trawling has also been conducted in Pool 14 using a similarly small (4.8-m footrope) balloon trawl having 6.3-mm mesh in the cod end (Lawler, Matusky and Skelly Engineers 1993). A rockhopper trawl with 10-m footrope has been used in studies of the potential effects of commercial navigation on fishes of Pool 26 of the Mississippi River and the lower Illinois River. This trawl is substantially larger than the LTRMP trawl and proved effective for the capture of large riverine fishes such as adult shovelnose sturgeon *Scaphirhynchus platorynchus*, blue sucker *Cycleptus elongatus*, and blue catfish *Ictalurus furcatus*.

The objective of this study was to sample the main channel of Pools 8 and 13 of the Upper Mississippi River with a 10-m rockhopper bottom trawl during one month of the fall. The data presented herein provide preliminary information to compare across pools catch rates and species richness of fishes in the main channel.

Methods

We used a rockhopper bottom trawl to sample the main channel of Pools 8 and 13 of the Upper Mississippi River, as well as two side channels (Big Soupbone and Crooked Slough) of Pool 13. The trawl was made with a four-seam construction; its dimensions included a 10.2-m footrope and a 8.0-m headrope. The mesh of both mouth and cod end consisted of #21 nylon twine with a mesh size of 2.54 cm, bar measure. At each site, we trawled for 15 minutes (unless the trawl became snagged) in an upstream direction at speeds of 1.5-2.5 m/s. Proper expansion of the doors and trawl, and therefore capture efficiency, relies on the speed of the trawl relative to the water. In the presence of current, obtaining a particular speed relative to the water requires lower speed relative to the ground when traveling upstream than when traveling downstream.

Therefore trawling upstream results in less violent deceleration on immovable snags than does trawling downstream. At least eight sites were chosen within each pool and selected to explore potential differences in catch above and below the control point of each pool. Sites were chosen to avoid hazardous areas (e.g. pipelines, shallow depths). Sampling was conducted during late November in Pool 8 and early December in Pool 13; sampling originally planned for Pool 4 could not be done due to mechanical problems with the trawler before the pool froze for the season. All fish were identified, measured, and released. Catch-per-unit-effort (CPUE) was calculated for each sample as the number of fish/h of trawling. We reported mean CPUE as the average of the sample-specific CPUEs.

Results

We sampled 25 fish species (Table 1) from Pools 8 and 13 combined. Rockhopper trawling in the main channel resulted in a mean CPUE of 87.9 fish/h from Pool 8 and 146.3 fish/h from Pool 13. Species richness was similar in both pools (13 species, Pool 8; 14 species, Pool 13; Table 2). Shovelnose sturgeon, shorthead redhorse, and sauger comprised the majority of the catch in both pools (Table 2). Silver redhorse also were prevalent in Pool 8, whereas silver chub were an important component of the catch in Pool 13 (Table 2). Catches consisted mainly of large adult fish; mean length of all fish collected was 333.5 $\pm$ 10.7 mm in Pool 8 and 396.5 $\pm$ 6.4 mm in Pool 13. Even with low sampling effort in Pool 8 (99 minutes of trawling) and Pool 13 (146 minutes of trawling), several species considered uncommon were collected. For example, lake sturgeon and blue sucker captured from Pool 8 and 13 are considered rare by most biologists. Smallmouth bass was another species unexpectedly found in the main channel of Pool 13.

An initial examination of CPUE across several main channel sites in Pool 8 suggests spatial differences in the relative abundance of fish may occur within the main channel of a pool of the Upper Mississippi River. CPUE at upper pool sites (River Mile >695) was 141.8 fish/h, whereas CPUE at lower pool sites was 44.7 fish/h (River Mile <695; Table 3). Differences in species richness also occurred, largely because certain species appeared to be restricted to upper or lower pool habitats. Species found only in the upper pool were shovelnose sturgeon, lake sturgeon, gizzard shad, and quillback. Lower pool catches contained fewer species, but did include channel catfish, which were not sampled in the upper pool.

A similar spatial pattern in the main channel fish assemblage occurred in Pool 13, although not as distinctly as in Pool 8. CPUE at upper pool sites (River Mile >538) was 161.7 fish/h, whereas CPUE at lower pool sites (River Mile <538) was 121.4 fish/h (Table 4). Species composition across upper and lower pool sites was also similar to Pool 8. Shovelnose sturgeon, again were present only at upper pool sites. Smallmouth bass and bigmouth buffalo, species not collected in Pool 8, were only collected in the upper pool. Gizzard shad were collected only at lower pool sites of Pool 13.

Catches from side channel sampling in Pool 13 indicate that the rockhopper trawl can be an effective gear in this habitat. Catch rates were extremely high, averaging 900 fish/h. Extremely large fish were collected in these side channels; mean fish weight was 2,570.0 $\pm$225.0 g. In addition, several species were sampled in the side channels that were not sampled in the

main channel of Pool 13 during that time period (Table 5). Examples of such species were common carp, white bass, freshwater drum, and black buffalo.

Discussion

Several potential benefits of the rockhopper trawl in the Upper Mississippi River are evident from this study. The rockhopper trawl effectively collects numerous species from different parts of the main channel within multiple navigation pools. Furthermore, many fishes use the main channel, even during late fall and winter. The potential importance of the main channel to fishes during winter could be an important contribution to our understanding of how large river fish assemblages are regulated. Catch rates and species richness were greater in the upper reaches of Pools 8 and 13, suggesting that the impact of navigation dams on current velocity in the main channel may also be an important structuring force for main channel fish assemblages. This ability to investigate the influence of temporal, spatial, and hydrological factors on main channel fish assemblages is needed to better understand how large river fish assemblages generally function. Because information on main channel fish assemblages is lacking, there is a need for a gear such as the rockhopper trawl that effectively samples fish in the main channel of large rivers across a large range of hydrological and seasonal conditions.

Furthermore, preliminary sampling in side channels of Pool 13 suggests that the rockhopper trawl can directly compare the catch of fishes in the main channel to other habitat types in large river systems. A more extensive comparison between main channel and side channel habitats would provide an opportunity to approach important ecological questions such as seasonal movements, overwintering habitats, and monitoring the shifts in abundance of fish assemblages across various river habitat types. Paired comparisons of abundance between the largest riverine side channels and adjacent navigation channels, coupled with telemetry on movements and energy expenditures by individual fish, would help quantify the degree to which disturbance by navigation traffic might affect abundance of fish. With this information, we can begin to understand the relative importance of main channel habitat to river fishes, which is critical to managers and decision makers interested in protecting large river ecosystems.

The 10-m rockhopper trawl used in this study is an effective gear that can provide needed information on adult fish in the main channel of the Upper Mississippi River System. Because of the demonstrated effectiveness of the 10-m rockhopper trawl and the fact that it can be deployed in the main channel, which is sampled on an optional basis by the LTRMP, we recommend that this method of trawling be considered by the LTRMP as a way to obtain reliable information on adult fishes from this large and controversial aquatic area.

Acknowledgments

The Long Term Resource Monitoring Program of the Upper Mississippi River System provided funding for this project. We also wish to thank the personnel at the Long Term Resource Monitoring Program field stations in Lake City, Minnesota; Bellevue, Iowa; Onalaska, Wisconsin; and Alton, Illinois for their continued support through coordinating and assisting in field work. Special thanks go to Chad Dolan, John Rader, and Mike Marlen, for maintaining high professional and safety standards throughout the study.

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Table 1. List of the common and scientific names of fishes collected by rockhopper trawling in Pools 8 and 13 of the Mississippi River during fall 1997.

Common name	Scientific name
Lake sturgeon	*Acipenser fulvescens*
Shovelnose sturgeon	*Scaphirhynchus platorynchus*
Goldeye	*Hiodon alosoides*
Mooneye	*Hiodon tergisus*
Gizzard shad	*Dorosoma cepedianum*
Common carp	*Cyprinus carpio*
Silver chub	*Macrhybopsis storeriana*
Quillback	*Carpiodes cyprinus*
Blue sucker	*Cycleptus elongatus*
Northern hog sucker	*Hypentelium nigricans*
Smallmouth buffalo	*Ictiobus bubalus*
Bigmouth buffalo	*Ictiobus cyprinellus*
Black buffalo	*Ictiobus niger*
Silver redhorse	*Moxostoma anisurum*
Golden redhorse	*Moxostoma erythrurum*
Shorthead redhorse	*Moxostoma macrolepidotum*
Channel catfish	*Ictalurus punctatus*
Flathead catfish	*Pylodictis olivaris*
River darter	*Percina shumardi*
White bass	*Morone chrysops*
Smallmouth bass	*Micropterus dolomieu*
Sauger	*Stizostedion canadense*
Walleye	*Stizostedion vitreum*
Freshwater drum	*Aplodinotus grunniens*

Table 2. Catch-per-unit-effort (CPUE; fish/h) for fishes collected by rockhopper trawling in the main channel of Pools 8 and 13 of the Upper Mississippi River during fall 1997. We calculated CPUE for the upper and lower pool reaches of each Navigation Pool, as well as for the entire Pool. N is the number of fish collected.

	Upper Pool		Lower Pool		Entire Pool	
Species	N	CPUE (SE)	N	CPUE (SE)	N	CPUE (SE)
		Pool 8				
Channel catfish	0	0	1	1.00 (1.00)	1	0.50 (0.50)
Golden redhorse	1	3.00 (3.00)	0	0	1	1.50 (1.50)
Gizzard shad	1	2.00 (2.00)	0	0	1	1.00 (1.00)
Lake Sturgeon	1	3.00 (3.00)	0	0	1	1.50 (1.50)
Mooneye	4	6.00 (2.58)	5	5.50 (2.50)	9	5.75 (1.67)
Northern hog sucker	2	4.67 (2.91)	2	2.00 (1.16)	4	3.33 (1.53)
Quillback	2	4.00 (2.83)	0	0	2	2.00 (1.51)
Sauger	6	14.67 (11.20)	2	2.00 (1.16)	8	8.33 (5.73)
Shorthead redhorse	59	159.00 (132.29)	21	21.00 (18.36)	80	90.00 (67.10)
Shovelnose sturgeon	10	26.00 (23.35)	0	0	10	13.00 (11.87)
Silver chub	7	8.33 (3.79)	5	5.00 (5.00)	12	6.67 (2.97)
Silver redhorse	8	20.00 (14.14)	5	5.50 (2.50)	13	12.75 (7.19)
Walleye	3	3.67 (1.37)	0	0	3	1.83 (0.94)
		Pool 13				
Bigmouth buffalo	1	0.40 (0.40)	0	0	1	0.29 (0.29)
Blue sucker	0	0	1	1.00 (1.00)	1	0.29 (0.29)
Channel catfish	2	0.80 (0.80)	0	0	2	0.57 (0.39)
Flathead catfish	1	1.20 (1.20)	1	1.00 (1.00)	2	1.14 (0.88)
Gizzard shad	0	0	2	2.50 (1.50)	2	0.71 (0.50)

Table 2, Continued	N	CPUE (SE)	N	CPUE (SE)	N	CPUE (SE)
Golden redhorse	1	0.40 (0.40)	2	2.00 (2.00)	3	0.86 (0.62)
Mooneye	6	2.43 (1.07)	8	17.50 (8.38)	14	6.74 (2.96)
Quillback	2	0.86 (0.86)	1	1.00 (1.00)	3	0.90 (0.66)
Sauger	21	11.63 (4.63)	18	19.00 (15.26)	39	13.74 (5.18)
Shorthead redhorse	66	52.14 (16.77)	20	20.15 (18.65)	86	43.00 (13.35)
Smallmouth bass	1	1.20 (1.20)	0	0	1	0.86 (0.86)
Shovelnose sturgeon	153	182.00 (112.89)	0	0	153	130 (82.60)
Silver chub	27	26.06 (16.78)	28	58.5 (31.95)	55	35.33 (14.93)
Walleye	2	1.63 (1.23)	2	2.50 (1.50)	4	1.88 (0.95)

Table 3. Mean length (1 SE) and mean weight (1 SE) of fish captured by rockhopper trawl in the main channel of upper pool and lower pool reaches of Pools 8 and 13 of the Upper Mississippi River during November 1997. Lengths were measured as mm total length, except for sturgeons, which were measured to fork length; weights were measured as g wet weight. NA= not applicable.

	Upper Pool		Lower Pool	
Species	Mean Length	Mean weight	Mean length	Mean weight
		Pool 8		
Channel catfish	NA	NA	479.0	1032.0
Gizzard shad	160.0	44.0	NA	NA
Golden redhorse	228.0	122.0	NA	NA
Lake sturgeon	559.0	1154.0	NA	NA
Mooneye	153.5 (4.7)	29.8 (3.5)	146.0 (5.0)	20.4 (3.4)
Northern hog sucker	248.0 (5.4)	147.5 (18.5)	232.5 (12.5)	124.5 (25.5)
Quillback	307.0 (55.0)	428.0 (226.0)	NA	NA
Sauger	326.8 (25.4)	322.1 (83.7)	283.5 (0.5)	158.0 (8.0)
Shorthead redhorse	337.4 (7.8)	422.1 (28.1)	341.4 (11.9)	418.0 (91.2)
Shovelnose sturgeon	661.8 (27.1)	1194.8 (169.5)	NA	NA
Silver chub	155.1 (3.7)	32.9 (2.9)	155.2 (2.5)	23.6 (2.8)
Silver redhorse	356.1 (15.9)	472.4 (62.3)	425.0 (39.9)	966.4 (294.3)
Walleye	346.5 (13.2)	477.0 (36.9)	300.2 (17.0)	376.2 (60.4)
		Pool 13		
Bigmouth buffalo	466.0	1686.0	NA	NA
Blue sucker	NA	NA	375.0	352.0
Channel catfish	328.5(123.5)	501.5 (424.5)	NA	NA
Flathead catfish	414.0	783.0	NA	NA
Gizzard shad	NA	NA	130.5 (20.5)	22.0 (10.0)

Table 3, Continued	Mean length	Mean weight	Mean length	Mean weight
Golden redhorse	335.0	425.0	310.5 (6.5)	321.5 (39.6)
Mooneye	169.5 (14.9)	63.5 (17.5)	155.9 (19.0)	47.0 (28.3)
Quillback	278.0 (56.0)	327.5 (181.5)	242.0	200.0
Sauger	275.0 (13.8)	219.7 (40.5)	313.8 (13.2)	324.6 (61.4)
Shorthead redhorse	376.4 (6.4)	597.3 (33.3)	330.4 (13.1)	402.0 (60.0)
Shovelnose sturgeon	534.1 (6.2)	619.7 (26.6)	NA	NA
Silver chub	146.7 (1.8)	26.1 (1.2)	152.9 (1.9)	32.4 (1.5)
Smallmouth bass	214.0	130.0	NA	NA
Walleye	353.0 (7.0)	415.5 (46.5)	197.5 (6.5)	62.0 (8.0)

Table 4 Fish collected with the rockhopper trawl in two side channels of upper Pool 13 of the Mississippi River during December 1997.

Species	N	Mean total length (mm)	Mean wet weight (g)	CPUE (fish per h)
Crooked Slough Side Channel				
Common carp	3	625.0 (55.7)	3966.7 (1088.9)	12.00
Channel catfish	3	518.3 (28.1)	1634.0 (285.3)	12.00
Freshwater drum	70	145.4 (10.8)	201.5 (72.8)	280.0
Sauger	2	432.5 (12.5)	1347.0 (255.0)	7.98
Shorthead redhorse	9	351.0 (34.2)	577.8 (153.2)	36.00
Smallmouth buffalo	1	380.0	958.0	4.02
Walleye	16	241.6 (30.4)	300.9 (140.8)	64.02
White bass	5	148.0 (22.5)	60.2 (28.4)	19.98
Big Soupbone Side Channel				
Black buffalo	1	590.0	-----	4.26
Bigmouth buffalo	2	436.5 (11.5)	1500.0	8.58
Common carp	171	539.6 (4.3)	2572.8 (226.5)	732.6
Freshwater drum	2	547.0 (153.0)	3770.0 (2980.0)	8.58
Mooneye	1	295.0	256.0	4.26
Sauger	1	332.0	268.0	4.26
Shorthead redhorse	39	418.8 (13.5)	890.0 (85.2)	167.2
Smallmouth buffalo	3	478.7 (54.0)	2083.3 (845.7)	12.84
Silver chub	3	129.3 (2.7)	17.7 (2.0)	12.84